IN THE CLAIMS

2. (*Currently amended*) A computer-based method for prediction of behavior in a financial system using financial return data, the method comprising the steps of:

~~(a)~~ inputting the financial return data and a set of independent variables corresponding to properties of the financial system into a computer, wherein the financial return data comprises a plurality of data points having multiple co-variances which are collected over time;

generating a co-variance matrix comprising the steps of:

~~(b)~~(a) defining a first loading matrix having elements comprising a first subset of independent variables within the set of independent variables, the first subset comprising a least quantity of independent variables estimated to fit the financial return data;

~~(c)~~(b) determining a goodness-of-fit to the ~~measured~~ financial return data according to a selected goodness-of-fit criterion for each independent variable ~~of the first subset of independent variables~~ within the first loading matrix;

~~(d)~~(c) culling each independent variable within the first ~~subset~~ loading matrix whose presence or elimination fails to change the goodness-of-fit to produce a reduced element first loading matrix;

~~(e)~~(d) defining a next ~~subset of independent variables larger~~ loading matrix containing a larger subset of independent variables than the first ~~subset of independent variables~~ loading matrix;

~~(f)~~(e) adding the next ~~subset of independent variables~~ loading matrix to ~~a remaining group of the first subset of independent variables~~ the reduced element first loading matrix to define a ~~combined group of independent variables~~ combination of loading matrix elements;

~~(g)~~(f) determining the goodness-of-fit to the financial return data for the ~~combined group of independent variables~~ combination of loading matrix elements;

~~(h)~~(g) culling each independent variable of the ~~combined group of independent variables~~ combination of loading matrix elements whose presence or elimination fails to change the goodness-of-fit; and

~~(i)~~(h) repeating steps ~~(e)~~(d) through ~~(h)~~(g) until the goodness-of-fit to the financial return data meets the selected goodness-of-fit criterion in a final iteration~~; and~~ , wherein

the resulting co-variance matrix comprises the combination of loading matrix elements wherein the number of off-diagonal, non-zero loading matrix elements in the co-variance matrix is minimized and

~~(j) providing an output comprising the combined group of independent variables remaining after the final iteration,~~ wherein the remaining independent variables comprise the smallest subset of independent variables that fits the financial return data.

3. (*Currently amended*) The computer-based method of claim 2, wherein the financial return data comprises daily returns of financial securities~~, wherein the daily returns have unknown co-variances~~.

4. (*Currently amended*) The computer-based method of claim 3, wherein the daily returns comprise a linear combination of unknown factors and a part that fluctuates independently corresponding to noise, according to the relationship

$$X_\alpha = \sum_{\beta=1}^{k} \Lambda_{\alpha,\beta} f_\beta + N_\alpha ,$$

where α and ß are financial securities, X_α is the daily return for financial security α, f_β is an unknown factor, $\Lambda_{\alpha,\beta}$ is ~~a~~ the loading matrix, and N_α is the noise.

5. (*Original*) The computer-based method of claim 2, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship

$$L = -2 \ln \Pr(D|M) = \sum_n w_n \left(\ln \|V_n\| + x_n \bullet V_n^{-1} \bullet x_n \right),$$

where L is the log-likelihood function, V is the covariance matrix, $\Pr(D|M)$ is a goodness-of-fit quantity measuring the probability of data D given model M, and w_n is an arbitrary weight.

6. (*Original*) The computer-based method of claim 2, wherein the least quantity of independent variables corresponds to zero unknown factors and a covariance matrix consisting of a diagonal.

7. (*Canceled*).

8. (*Currently Amended*) A system for prediction of behavior in a financial system using financial return data, the system comprising:

a computer having an input for receiving the return data comprising a plurality of data points having multiple co-variances collected over a period of time and a set of independent variables corresponding to properties of the financial system;

computer software contained within the computer for performing a plurality of iterations, each iteration comprising identifying a loading matrix having elements comprising a subset of independent variables within the set of independent variables and determining a goodness of fit to the ~~measured~~ financial return data according to a selected goodness-of-fit criterion for each independent variable of the subset, eliminating each independent variable within the subset whose presence or elimination fails to change the goodness-of-fit at the predetermined minimum level, and combining, after the plurality of iterations, remaining independent variables to identify the smallest subset of independent variables that fits the financial return data to ~~generate an output~~ produce a co-variance matrix from a combination of loading matrices wherein the remaining independent variables correspond to loading matrix elements remaining after minimizing the number of off-diagonal, non-zero loading matrix elements;

wherein the plurality of iterations utilizes increasingly larger subsets of independent variables.

9. (*Currently amended*) The system of claim 8, wherein the financial return data comprises daily returns of financial securities~~, wherein the daily returns have unknown covariances~~.

10. (*Currently amended*) The system of claim 9, wherein the daily returns comprise a linear combination of unknown factors and a part that fluctuates independently corresponding to noise, according to the relationship

$$X_\alpha = \sum_{\beta=1}^{k} \Lambda_{\alpha,\beta} f_\beta + N_\alpha ,$$

where a and ß are financial securities, X_a is the daily return for financial security a, $f_ß$ is an unknown factor, $\Lambda_{a,ß}$ is ~~a~~ the loading matrix, and N_a is the noise.

11. (*Original*) The system of claim 8, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship

$$L = -2\ln \Pr(D|M) = \sum_n w_n \left(\ln\|V_n\| + x_n \bullet V_n^{-1} \bullet x_n\right),$$

where L is the log-likelihood function, V is the covariance matrix, $\Pr(D|M)$ is a goodness-of-fit quantity measuring the probability of data D given model M and w_n is an arbitrary weight.

12. (*Original*) The system of claim 8, wherein the least quantity of independent variables corresponds to zero unknown factors and a covariance matrix consisting of a diagonal.

13. (*Canceled*).

14. (*Currently amended*) A computer-based method for prediction of behavior in a financial system comprising:

estimating a multi-variable covariance matrix of the financial system comprising a plurality of variables and a plurality of factors using a subset of the plurality of factors, wherein the subset comprises the minimum number of factors capable of describing the plurality of variables, wherein the subset is selected by iteratively modeling each variable as a linear combination of unknown factors and a noise factor starting with zero factors and adding one factor with each iteration until a model is identified for which no further improvement occurs.

15. (*Original*) The computer-based method of claim 14, wherein improvement is determined by a goodness-of-fit criterion comprising a log-likelihood function which is minimized using a conjugate gradient.

16. (*New*) The computer-based method of Claim 14, wherein each iteration comprises the steps of:

defining a loading matrix containing a group of factors;

minimizing the number of off-diagonal, non-zero factors in the loading matrix;

wherein the covariance matrix is estimated by combining the loading matrices having a minimized number of off-diagonal, non-zero factors.